DECLARATION

I, Nobuaki Kato, a Japanese Patent Attorney registered No. 8517, of Okabe International Patent Office at No. 602, Fuji Bldg., 2-3, Marunouchi 3-chome, Chiyoda-ku, Tokyo, Japan, hereby declare that I have a thorough knowledge of Japanese and English languages, and that the attached pages contain a correct translation into English of the priority documents of Japanese Patent Application No. 07-187433 filed on July 24, 1995 in the name of CANON KABUSHIKI KAISHA.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made, are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

signed this 15th day of January, 2003

NOBUAKI KATO

PATENT OFFICE
JAPANESE GOVERNMENT

This is to certify that the annexed is a true copy of the following application as filed with this Office.

Date of Application: July 24, 1995

Application Number: Japanese Patent Application No. 7-187433

Applicant(s): CANON KABUSHIKI KAISHA

August 16, 1996

Commissioner,
Patent Office HISAMITSU ARAI (Seal)

Certificate No. 08-3055893

7-187433

[Name of the document] Patent Application

[Reference No.] 3072122

[Date] July 24, 1995

[Addressed to] Commissioner, Patent Office

[International Classification] H04N 5/00

[Title of the Invention] IMAGE PICKUP SYSTEM AND IMAGE PICKUP UNIT, AND PIKED-UP IMAGE SIGNAL PROCESSING DEVICE

[Number of the Claims] 20

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[Indication of Official Fee]

[Way of Payment] Prepaid

[Prepayment Ledger No.] 011707

[Amount] 21000

[List of Filed Materials]

[Material] Specification 1

[Material] Drawings 1

[Material] Abstract 1

[General Power of Attorney] 9004560

[Proof Requirement] Required

CFT4082

07-187433

[Name of the Document] Specification

[Title of the Invention] Image Pickup System and Image Pickup Unit, and Picked-up Image Signal Processing Device

[Claim(s)]

[Claim 1] An image pickup system which has at least one image pickup unit having at least one connection terminal and connectable to an external apparatus,

said image pickup unit connected to an arbitrary connection terminal of said external apparatus which has at least one connection terminal including means for exchanging data with said external apparatus,

said image pickup system comprising two or all of the following means:

detecting means for detecting one or both of an operating state and a connected state of said image pickup unit;

display means for displaying one or both of the operating state and the connected state of said image pickup unit; and

recording means for recording one or both of the operating state and the connected state of said image pickup unit.

[Claim 2] An image pickup system according to

claim 1, wherein said image pickup unit is arranged to transmit to said external apparatus information required for displaying one or both of the operating state and the connected state of said image pickup unit.

[Claim 3] An image pickup system according to claim 1, wherein a display device included in said image pickup unit is employed as said means for displaying one or both of the operating state and the connected state of said image pickup unit.

[Claim 4] An image pickup system according to claim 1, wherein said image pickup unit is arranged to transmit to said external apparatus information required for recording one or both of the operating state and the connected state of said image pickup unit.

[Claim 5] An image pickup system according to claim 1, wherein a recording device included in said image pickup unit is employed as said means for recording one or both of the operating state and the connected state of said image pickup unit.

[Claim 6] An image pickup system according to claim 1, wherein said image pickup unit is arranged to cause means for protecting a lens to act as said means for displaying one or both of the operating state and the connected state of said image pickup unit.

[Claim 7] An image pickup system which has an external apparatus having at least one connection terminal and at least one image pickup unit connectable

to said external apparatus,

said external apparatus including means for exchanging data with said image pickup unit connected to an arbitrary connection terminal of said external apparatus having at least one connection terminal,

said image pickup system comprising two or all of the following means:

detecting means for detecting one or both of an operating state and a connected state of said image pickup unit;

display means for displaying one or both of the operating state and the connected state of said image pickup unit; and

recording means for recording one or both of the operating state and the connected state of said image pickup unit.

[Claim 8] An image pickup system according to claim 7, wherein said means for displaying one or both of the operating state and the connected state of said image pickup unit is a display device provided at said external apparatus.

[Claim 9] An image pickup system according to claim 7, wherein a display device included in said image pickup unit is employed as said means for displaying one or both of the operating state and the connected state of said image pickup unit.

[Claim 10] An image pickup system according to

claim 7, wherein a recording device provided at said external apparatus is employed as said means for recording one or both of the operating state and the connected state of said image pickup unit.

[Claim 11] An image pickup system according to claim 7, wherein a recording device included in said image pickup unit is employed as said means for recording one or both of the operating state and the connected state of said image pickup unit.

[Claim 12] An image pickup system according to claim 7, wherein said external apparatus is arranged to cause means for protecting a lens of said image pickup unit to act as said means for displaying one or both of the operating state and the connected state of said image pickup unit.

[Claim 13] An image pickup unit comprising:

image pickup means for picking up an optical image to form a picked-up image signal;

interface means for communication with an external signal processing device; and

transmission means for transmitting to said external signal processing device through said interface means a state signal relating to an operating state of said image pickup means or a connected state of said interface means.

[Claim 14] An image pickup unit according to claim 13, wherein said image pickup unit is arranged to

be removably attachable to said external signal processing device.

[Claim 15] An image pickup unit according to claim 13, further comprising display means arranged to change a display state thereof in response to said state signal.

[Claim 16] An image pickup unit according to claim 13, wherein said external signal processing device has display means arranged to change a display state thereof in response to said state signal.

[Claim 17] A picked-up image signal processing device comprising:

interface means for communication with an image pickup unit which includes image pickup means for picking up an optical image to form a picked-up image signal; and

receiving means for receiving a state signal coming from said image pickup unit through said interface means and relating to an operating state or a connected state of said image pickup unit.

[Claim 18] A picked-up image signal processing device according to claim 17, wherein said image pickup unit is arranged to be removably attachable to said picked-up image signal processing device.

[Claim 19] A picked up image signal processing device according to claim 17, further comprising display means arranged to change a display state

thereof in response to said state signal received by said receiving means.

[Claim 20] A picked-up image signal processing device according to claim 17, further comprising recording means for recording said state signal received by said receiving means.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

This invention relates to an image pickup system, in which a computer for performing image processing is attached for use to an image pickup unit, and an image pickup unit, as well as image signal processing apparatus.

[0002]

[Prior Art]

Computers of the kind having connection terminals in compliance with the PCMCIA standards are generally arranged to use card-shaped device units arranged to function differently as a facsimile, memories, etc., with these device units inserted into the connection terminals. For these connection terminals, as long as a unit to be connected meets the PMCIA standards, it can be replaced with any unit having another function.

[0003]

Fig. 9 shows by way of example an image pickup system, which performs an image pickup action, by

connecting a removably attachable image pickup unit to the computer having these connection terminals.

[0004]

Referring to Fig. 9, 21 denotes an image pickup unit which is formed in a card-like shape, 22 denotes a computer of the image pickup system, 23 denotes a connection terminal, 24 and 25 denote the above-mentioned connection terminals of the computer, 26 denotes a lens of the image pickup unit 21, and 27 denotes a cover, which can be opened and closed, for protecting the lens 26.

[0005]

Here, in a case where the image pickup unit 21 is used by connecting it to the connection terminal 24, in the image pickup system shown in Fig. 9, the image pickup unit 21 picks up an image at a CCD with its built-in optical system and transfers the picked-up image data to the computer 22 via the connection terminal 24 after converting to the digital data. The computer 22 processes the picked-up image data sent from the image pickup unit 21 and can display on a built-in display system or record in a memory system. The image pickup unit 21 has a cover 27 at the lens 26 portion, and when the image pickup unit is not used, a operator protects the lens 26 by closing the cover 27.

[0006]

[Problem to be Solved by the Invention]

The image pickup system and an image signal processing device related thereto, however, have presented the following problems.

[0007]

(1) There has been no means for enabling the operator of the image pickup system or the computer to confirm the connected state of the image pickup unit. Therefore, if a program of control over the image pickup unit happens to be executed in a state of having the image pickup unit not adequately connected to the computer, either the program or the computer might malfunction to necessitate a long period of time before resumption of its normal state.

Further, with the computer having a plurality of connection terminals, if the connection terminal to which the image pickup unit is connectable is limited among the plurality of connection terminals, there is a probability that the image pickup unit will be connected to a wrong connection terminal.

[0008]

(2) There has been no means for enabling the operator of the image pickup system or the computer to confirm the operating state of the image pickup unit. Therefore, if the picked-up image data is not monitored by means of a display device contained in the computer, it has been impossible to confirm the operating state of the image pickup unit. Even in a case where the

picked-up image data is arranged to be monitored, it is sometimes hardly possible to intuitionally know the data of operation such as the image pickup speed of the image pickup unit and the number of colors in use, etc.

[0009]

(3) The image pickup system has been provided with no means for enabling the operator of the image pickup system to know the pickup conditions under which previous image data has been obtained.

[0010]

(4) A lens cover of the image pickup unit has nothing to do with the operation of the image pickup unit. In such a case, the lens cover has necessitated the operator of the image pickup system to close the lens cover when the image pickup unit is not used. Besides, it has sometimes happened that the operator of the image pickup system inadvertently operates the image pickup unit with the lens cover left closed.

[0011]

It is an object of this invention to provide an image pickup system in which an image pickup unit is connected for use to an image processing computer, which image pickup system is arranged to display to an operator an operating state and a connected state of the image pickup unit and record the operating state and the connected state and thus to effectively prevent any erroneous operation from being performed by the

operator of the image pickup system.

[0012]

[Means for solving the Problem]

To attain the above objects, in accordance with this invention, there is provided an image pickup system comprising means for transmitting and receiving data between an image pickup unit and a computer which are interconnected, means provided at the image pickup unit or the computer for detecting, displaying and recording an operating state and a connected state of the image pickup unit, and means for causing a device for protecting a lens of the image pickup unit to operate according to a result of the detection of the operating state and the connected state.

[0013]

To attain the above objects, in accordance with this invention, there is provided an image pickup unit comprising image pickup means for picking up an optical image to form a picked-up image signal, interface means for communication with an external signal processing device, and transmission means for transmitting to the external signal processing device through the interface means a state signal relating to an operating state of the image pickup means or a connected state of the interface.

[0014]

To attain the above objects, in accordance with

this invention, there is provided a picked-up image signal processing device comprising interface means for communication with an image pickup unit which includes image pickup means for picking up an optical image to form a picked-up image signal, and receiving means for receiving a state signal coming from the image pickup unit through the interface means and relating to an operating state or a connected state of the image pickup unit.

[0015]

[Embodiment(s)]

Embodiments of the present invention will be described as embodiments 1 to 3.

[0016]

(Embodiment 1)

An embodiment 1 of this invention is described with reference to Figs. 1 to 4.

[0017]

Referring to Fig. 1, reference numeral 1 denotes an image pickup unit (camera unit) and reference numeral 2 denotes a computer for performing image processing. The computer 2 includes a CPU unit 3, connection terminals 4 and 5, an operation program 6 having stored therein a program for the operation of the CPU unit 3, a display system 7, and a memory system 8. The image pickup lens unit 1 includes a lens optical system (lens) 9, a CCD unit 10, and A/D

converter 11, a digital signal processing device (DSP) 12, an FIFO memory 13, a lens cover unit 14, a timing signal generator (TG) 15 for the CCD unit 10 and the A/D converter 11, a control unit 16 for controlling the operation of the image pickup unit 1, an interface (camera I/F) 17 for external connection, a lens cover 18, a liquid crystal display (LCD display) 19 for displaying several lines of characters, and a nonvolatile memory (NV RAM) 20.

[0018]

In Fig. 1, an image pickup system is used by connecting the image pickup unit 1 to the connection terminal 4 of the computer 2. Although the shape of the connection terminal 5 is the same as that of the connection terminal 4, the connection terminal 5 is arranged to inhibit the image pickup unit from being mechanically connected or at least from being electrically connected thereto.

[0019]

When the image pickup unit 1 is connected to the connection terminal 4, electric power is supplied to the image pickup unit 1 through the connection terminal 4. The control unit 16 then begins to operate. The CPU unit 3 detects through the connection terminal 4 that the image pickup unit 1 is connected to the computer 2.

[0020]

Upon detection of the connected state, the image pickup system performs processes as shown in Fig. 2. Upon detection of the fact that the image pickup unit 1 is separated from the connection terminal 4, the image pickup system performs processes as shown in Fig. 3. When an instruction for performing an image pickup action with the image pickup unit 1 is given by an operation program 6, the image pickup system performs processes as shown in Fig. 4.

[0021]

The flows of the above-stated processes are described below with reference to Figs. 2, 3 and 4.

[0022]

(1) Upon detection of connection (Fig. 2)

At (201), when an arbitrary device unit, which is assumed to be the image pickup unit 1 in this case, is connected to the connection terminal 4, the connection terminal 4 sends a connection signal to the CPU unit 3, so that the CPU unit 3 detects that the image pickup unit 1 is connected to the computer 2.

[0023]

At (202), the CPU unit 3 sends out, via the connection terminal 4, a test signal S2A to the control unit 16. The test signal S2A sent from the CPU unit 3 to the control unit 16 is a request for a check for the initial state of the image pickup unit 1. Upon receipt of the test signal S2A, the control unit 16 makes a

check for the state of electric power supplied from the computer 2, etc., so as to find if the connection is normally made. If so, the control unit 16 sends a signal S2B to the CPU unit 3, indicating that the image pickup unit 1 adequately connected to the computer 2. If not, the control unit 16 sends a signal S2C to the CPU unit 3, indicating that the image pickup unit 1 is not adequately connected to the computer 2.

[0024]

In the event of an attempt to connect the image pickup unit to the other connection terminal 5, instead of the terminal 4, the CPU unit 3 cannot receive the signal S2B nor the signal S2C and the connection cannot be made in a normal manner because, although the connection terminal 5 is in the same shape as the connection terminal 4, the connection terminal 5 is incapable of connecting the image pickup unit in terms of signals in this case.

[0025]

Upon receipt of the signal S2B, the CPU unit 3 makes a check for confirmation of the normal connection. The signal S2B carries intrinsic data of the image pickup unit 1 indicating a serial number, a manufacturer's name, etc. Such data is written (in a manner not reloadable) in the ROM which is disposed within the control unit 16.

[0026]

The signal S2B thus enables the CPU unit 3 to find the intrinsic data of the image pickup unit 1 and also to know to which of the plurality of connection terminals of the computer 2 the image pickup unit 1 is connected.

[0027]

If the connection is normally made, the flow comes to an action (203). If not, the flow comes to an action (207).

[0028]

At (203), the CPU unit 3 causes the display system 7 to provide a display indicating that the connection is normally made. The control unit 16 also causes the liquid crystal display 19 to provide a display indicating that the connection is normally made. These actions enable the operator of the image pickup system to know that the connection is made in a normal manner.

[0029]

At (204), the control unit 16 makes a check for the initial states of devices other than the control unit 16 included in the image pickup unit 1. The result of the check is sent out to the CPU unit 3 through the connection terminal 4. In this instance, if a result of the check indicates no abnormality in the devices included in the image pickup unit 1, the control unit 16 sends to the CPU unit 3 a signal S2D which indicates that there is no abnormality in the

image pickup unit 1, and the flow comes to an action (205). If the result of the check indicates some abnormality, the control unit 16 sends a signal S2E which indicates that there is some abnormality in the image pickup unit 1, and the flow comes to an action (208).

[0030]

At (205), data of shooting conditions previously used is recorded in the nonvolatile memory 19 of the image pickup unit 1. The previous shooting conditions remain unchanged unless they are changed by the CPU unit 3.

[0031]

Further, in the image pickup system, the operating state of the image pickup unit 1 obtained at the time of the previous shooting is recorded in the memory system 8 along with picked-up image data. It is possible to cause the image pickup unit 1 to operate in the same state as the state obtained at the time of the previous shooting by using this record.

[0032]

Decision as to whether the recorded previous operating state of the image pickup unit 1 is to be employed or the operating state of the image pickup unit is to be newly decided has already been made either by the operation program memory 9 or by the operator of the image pickup system.

[0033]

In here, the control unit 16 sends to the CPU 3 a signal S2F which represents the data of shooting conditions of the image pickup unit 1 including a number of frames per unit time (a frame speed), a number of colors in use, numbers of vertical and horizontal picture elements per frame, an amount of information carried by one picture element, etc.

[0034]

Upon receipt of the signal S2F, the CPU unit 3 causes the display system 7 to display information on the above-stated data according to the signal S2F. The control unit 16 also causes the information to be displayed on the liquid crystal display 19. The displays enable the operator of the image pickup system to know the shooting conditions and the details of an operation of the image pickup unit.

[0035]

At (206), the flow of the processes to be executed when the connection is detected comes to an end.

[0036]

If the signal S2B is not detected or if the signal S2C is detected at (207), the flow comes to perform a connection error processing action. In other words, the abnormal state of connection is displayed at the display system 7 of the computer 2 and on the liquid crystal display 19 of the image pickup unit 1. At this

time, it may be arranged to inform the operator of the abnormal state of connection, for example, with some suitable sound such as beep.

[0037]

If the signal S2D is not detected or if the signal S2E is detected at (208), the flow comes to perform an operation error processing action. At the step 208, the operator is informed that the image pickup unit 1 is inoperative as the image pickup unit 1 is out of order. This state is displayed on the liquid crystal display 19 of the image pickup unit 1 and also by the display system 7 of the computer 2.

[0038]

(2) Upon detection of separation of the image pickup unit

The processes to be executed by the image pickup system when the image pickup unit is found to have been separated are described with reference to Fig. 3.

[0039]

At (301), irrespective of the action of the image pickup unit 1, the connection terminal 4 sends a separation signal S3A to the CPU unit 3 indicating that the image pickup unit 1 is separated from the computer 2, when the image pickup unit 1 is detached from the connection terminal 4. The CPU unit 3 then detects that the image pickup unit 1 is separated from the connection terminal 4.

[0040]

Electric power to be used by the image pickup unit is supplied from the computer 2. When the image pickup unit is separated from the computer 2, the control unit 16 detects a drop of voltage and thereby detects the separated state.

[0041]

Even if the image pickup unit is not separated, the image pickup unit acts in the same manner as at the time of separation, in the event of stoppage of the operation of the computer 2 caused by some accident with respect to the supply of electric power. A capacitor is connected to the power supply circuit of the image pickup unit 1. The capacitor enables the image pickup unit 1 to remain operative for a period of several seconds in the event of stoppage of the supply of electric power from the computer 2.

[0042]

At (302), the CPU unit 3 causes the display system 7 to provide a display indicating that the image pickup unit is separated from the connection terminal 4. If any program that includes use of the image pickup unit 1 is in process of being executed, the program is stopped from being executed. The control unit 16 causes the liquid crystal display 19 to display also the separated state mentioned above.

[0043]

Upon detection of the separated state, the control unit 16 sends a control signal to the lens cover unit 14 to cause the lens cover driving unit 14 to close the lens cover (303). If the lens cover has already been closed, no action is performed by the lens cover driving unit 14.

[0044]

At (304), the flow of processes to be executed upon detection of separation of the image pickup unit comes to an end.

[0045]

(3) In performing an image pickup action

The processes to be executed by the image pickup system before and after an image pickup action are as described below with reference to the flowchart of Fig. 4.

[0046]

At (401), the flow of processes begins. The CPU unit 3 sends to the control unit 16 a control signal S4A which indicates the commencement of an image pickup action of the image pickup unit 1. At (402), upon receipt of the control signal S4A, the control unit 16 sends a signal to the lends cover unit 14 to cause the lens cover 18 to be opened. This action enables the lens 9 to grasp an object to be picked up. At (403), the control unit 16 causes the CCD 10, the A/D converter 11 and the DSP (digital signal processing

device) 12 to operate to measure a quantity of light incident on the lens 9 and perform an automatic exposure (AE) action. The control unit 16 then sends the signal S2F (see the action 205) to the CPU unit 3 (404).

[0047]

At (405), the CPU unit 3 uses the signal S2F to cause the display system 7 to display the operating state of the image pickup unit. The control unit 16, on the other hand, causes the liquid crystal display 19 to display the same operating state. These displays enable the operator of the image pickup system to know the shooting conditions of the image pickup unit and the details of the operation of the image pickup unit.

[0048]

At (406), image light incident on the lens 9 forms an image on the CCD. The CCD accumulates electric charge corresponding to the image. The electric charge is read out by the A/D converter 11. The electric charge accumulating time per frame is determined by the action (403). Picked-up image data thus obtained from the A/D converter 11 is processed by the DSP 12. The processed data is stored temporarily at the FIFO memory 13. The picked-up image data stored is aerially read out from the FIFO 13 according to the speed of data transmission from the camera interface 17 and the connection terminal 4 and is then transmitted to the

CPU unit 3. The electric charge accumulating time of the CCD 10 and the action of the A/D converter 11 are controlled by the timing signal generator 15. The timing signal generator 15, the DSP 12, the FIFO memory 13 and the camera interface 17 are controlled by the control unit 16.

[0049]

The picked-up image data supplied to the CPU unit 3 is displayed by the display system 7 and is recorded by the memory system, i.e., a recording device 8. The signal S2F which is obtained at the action (405) is also recorded concurrently with the picked-up image data. The signal S2F is recorded also in the nonvolatile memory 20. The operation of the CPU unit 3, the display method of the display system 7 and the recording method of the memory system 8 are all decided by a predetermined operation program of the operation program memory 6.

[0050]

At (407), a check is made to find if the image pickup action is to be terminated. If so, the CPU unit 3 sends to the control unit 16 a signal S4B which indicates the end of the image pickup action of the image pickup unit 1. Upon receipt of the signal S4B, the control unit 16 brings the image pickup action to an end. At this time, the picked-up image data recorded in the FIFO is continuously sent out until it

completely disappears from the FIFO.

[0051]

If the signal S4B is not detected, the flow comes back to execute the action (403). At that time, the actions of the action (403) may be executed after the lapse of a predetermined period of time.

[0052]

When the signal S4B is detected, the flow comes to an action (408). At (408), the control unit 16 sends a control signal to the lens cover unit 14 to cause the lens cover 18 to be closed.

[0053]

At (409), the flow of processes executed in performing the image pickup action comes to an end.

[0054]

(Embodiment 2)

The arrangement and operation of an embodiment 2 of this invention are about the same as the embodiment 1 except that the lens cover 18 of the image pickup unit 1 which is shown in Fig. 1 is arranged to operate differently from that of the first embodiment. The operation of the second embodiment is described with reference to Figs. 1, 3, 5 and 6 as follows. When the image pickup unit 1 is connected to the connection terminal 4, electric power is supplied to the image pickup unit 1 through the connection terminal 4. The control unit 6 then begins to act. Meanwhile, the CPU

unit 3 detects through the connection terminal 4 that the image pickup unit 1 is connected to the computer 2.

[0055]

Upon detection of the above-stated connection, the image pickup system which is the embodiment 2 of this invention begins to operate as shown in Fig. 5. When the image pickup system detects that the image pickup unit 1 is separated from the connection terminal 4, the image pickup system operates as shown in Fig. 3.

[0056]

When an instruction for an image pickup action of the image pickup unit 1 is given by an operation program of the operation program memory 9, the image pickup system operates as shown in Fig. 6.

[0057]

In the image pickup system of the embodiment 1, the lens cover 18 does not open at the time when the image pickup unit is connected to the computer and opens only when an image pickup action begins.

[0058]

In the image pickup system 15 of the embodiment 2, on the other hand, the lens cover 18 opens at (402) at the time when the image pickup unit 1 is connected to the computer 2. Further, the image pickup action is performed totally irrespective of the opening or closing of the lens cover 18, as shown in Fig. 6. The processes to be executed by the embodiment 2 when the

image pickup unit 1 is separated from the computer 2 are the same as in the case of the embodiment 1 (see Fig. 3).

[0059]

In the embodiment 2, the connection of the image pickup unit 1 to the computer 2 causes the lens cover 18 to open or close. Therefore, the action of the lens cover 18, in the second embodiment, may be arranged to be caused by the mechanical action of the connection terminal, instead of being controlled by the control unit 16.

[0060]

(Embodiment 3)

An embodiment 3 of this invention relates to the operation of the lens cover 18 to be performed in the arrangement of the embodiments 1 and 2. The following describes by way of example the operation of the lens cover 18 with reference to Figs. 1, 7 and 8.

Fig. 7 shows in an oblique view an image pickup system in which the image pickup unit 1 is connected to the computer 2 which is of the lap-top type. Referring to Fig. 8, the image pickup unit 1 is connected to the PCMCIA terminal 4 of the computer 2. The computer 2 is provided with a display system 7 which is a color LCD display having a predetermined angle of visibility. The display system 7 is provided with a movable part 7B and is thus arranged to permit the operator of the

image pickup system to turn the display system 7 to an easily viewable position.

[0061]

Fig. 8 is a side view of the image pickup system shown in Fig. 7.

[0062]

Referring to Fig. 8, a direction CD indicates a direction in which the lens 9 captures an object of shooting, i.e., the direction of a lens barrel which includes the lens 9. A direction DO is in parallel to a plane on which the computer 2 is set. A display plane direction DD and a direction DDH are always orthogonal to each other.

[0063]

The directions DO and DD form an angle ϕD which is shiftable within a range of 0 to 180 degrees. Another angle ϕC formed between the directions CD and DO is also shiftable within the range of 0 to 180 degrees.

[0064]

The lens cover unit 14 which is shown in Fig. 1 is arranged to vary the facing direction of the lens 9 as shown in Fig. 8 by means of a motor. In other words, when the angle ϕC is zero degree, the lens 9 is protected by the lens cover 18.

[0065]

The lens cover 18 does not protect the lens 9 when the angle ϕC is not zero degree ($\phi C \neq 0$ degree).

[0066]

At the time of "$\phi C \neq 0$ degree", the CPU unit 3 in Fig. 1 detects the angle ϕD through a signal from an angle detecting encoder (not shown) included in the display system 7. The CPU unit 3 then sends a signal to the control unit 16. In response to the signal, the control unit 16 controls the motor (not shown) included in the lens cover unit 14 in such a way as to make the directions CD and DDH parallel to each other.

[0067]

Incidentally, the angle ϕC is zero when the angle ϕD is less than 90 degrees.

[0068]

The above-stated action prevents the image pickup unit from performing an image pickup action when the lens 9 is protected by the lens cover 18. When the lens 9 is not protected by the lens cover 18, the image pickup unit is always directed toward a part where the display system 7 is easily viewable, so that the operator of the image pickup system can be captured as an object of shooting by the image pickup unit. Meanwhile, the operator of the image pickup system is enabled to know the operating state and the connected state of the image pickup system according to the direction of the lens 9.

[0069]

Further, the above-described embodiments of this

invention produce the following advantages.

[0070]

Since the function of processing the picked-up image signal formed by the image pickup unit and the function of controlling the image pickup action are arranged to be partly carried out by an external picked-up image signal processing device, the image pickup unit can be configured in a compact size. The image pickup unit therefore can be formed in a card-like shape such as a PCMCIA or the like.

[0071]

In cases where a picked-up image signal is to be processed by means of a computer or the like, the signal processing method of prior art has necessitated some duplicating part including processes of converting the picked-up image signal first into a signal of a TV format such as the format of the NTSC system and then into a digital signal for the computer. The embodiment of this application, on the other hand, can be arranged without any wasteful part.

[0072]

Further, according to the above-described embodiments, the image pickup function can be simply added to an external signal processing device, such as the computer. Besides, the arrangement according to this invention permits optimum control according to both the state of the computer and that of the image

pickup unit.

[0073]

It is a particularly advantageous feature of the embodiments that information of the image picking-up state of the image pickup unit, such as whether or not the lens cover is closed, which image pickup mode is selected, etc., can be received, recorded and displayed on the part of an external image signal processing device such as the computer, so that an image pickup system can be arranged according to this invention to have excellent operability.

[0074]

[Effect of the Invention]

As explained so far, according to this invention, in a case where a computer adapted for image processing is used with an image pickup unit connected thereto as an image pickup system, the image pickup system enables the operator of the system to know an operating state and a connected state of the image pickup unit and to reproduce actions previously performed by the image pickup unit and effectively prevents the operator from performing an erroneous operation.

[Brief Description of the Drawings]

[Fig. 1] A block diagram showing the arrangement of an image pickup system which is arranged according to this invention as an embodiment 1 thereof.

[Fig. 2] A flowchart showing processes to be

executed by the image pickup system which is the embodiment 1 of this invention.

[Fig. 3] A flowchart showing processes to be executed by the image pickup system when an image pickup unit is found to have been separated from a connection terminal.

[Fig. 4] A flowchart showing processes to be executed by the same image pickup system when an instruction is given according to an operation program to perform an image pickup action by using the image pickup unit.

[Fig. 5] A flowchart showing processes to be executed by an image pickup system which is an embodiment 2 of this invention when an image pickup unit is connected to a computer through a connection terminal.

[Fig. 6] A flowchart showing processes to be executed by the image pickup system which is the embodiment 2 when an instruction is given according to an operation program to perform an image pickup action by using the image pickup unit.

[Fig. 7] An oblique view showing the action of a lens cover in the image pickup system arranged as the embodiment 1 or 2 of this invention.

[Fig. 8] A side view showing the action of the lens cover in the image pickup system which is the embodiment 1 or 2.

[Fig. 9] A view showing by way of example the arrangement of a conventional image pickup system.

[Description of Reference Numerals or Symbols]

1 Image pickup unit

2 Computer for performing image processing

3 CPU unit

4 Connection terminal

5 Connection terminal

6 Operation program

7 Display system

8 Memory system

9 Lens optical system

10 CCD unit

11 A/D converter

12 Digital signal processing device (DSP)

13 FIFO memory

14 Lens cover unit

15 Timing signal generator (TG)

16 Control unit

17 Interface for external connection (camera I/F)

18 Lens cover

【書類名】　図面　[Name of the Document] Drawings

【図１】　Fig. 1

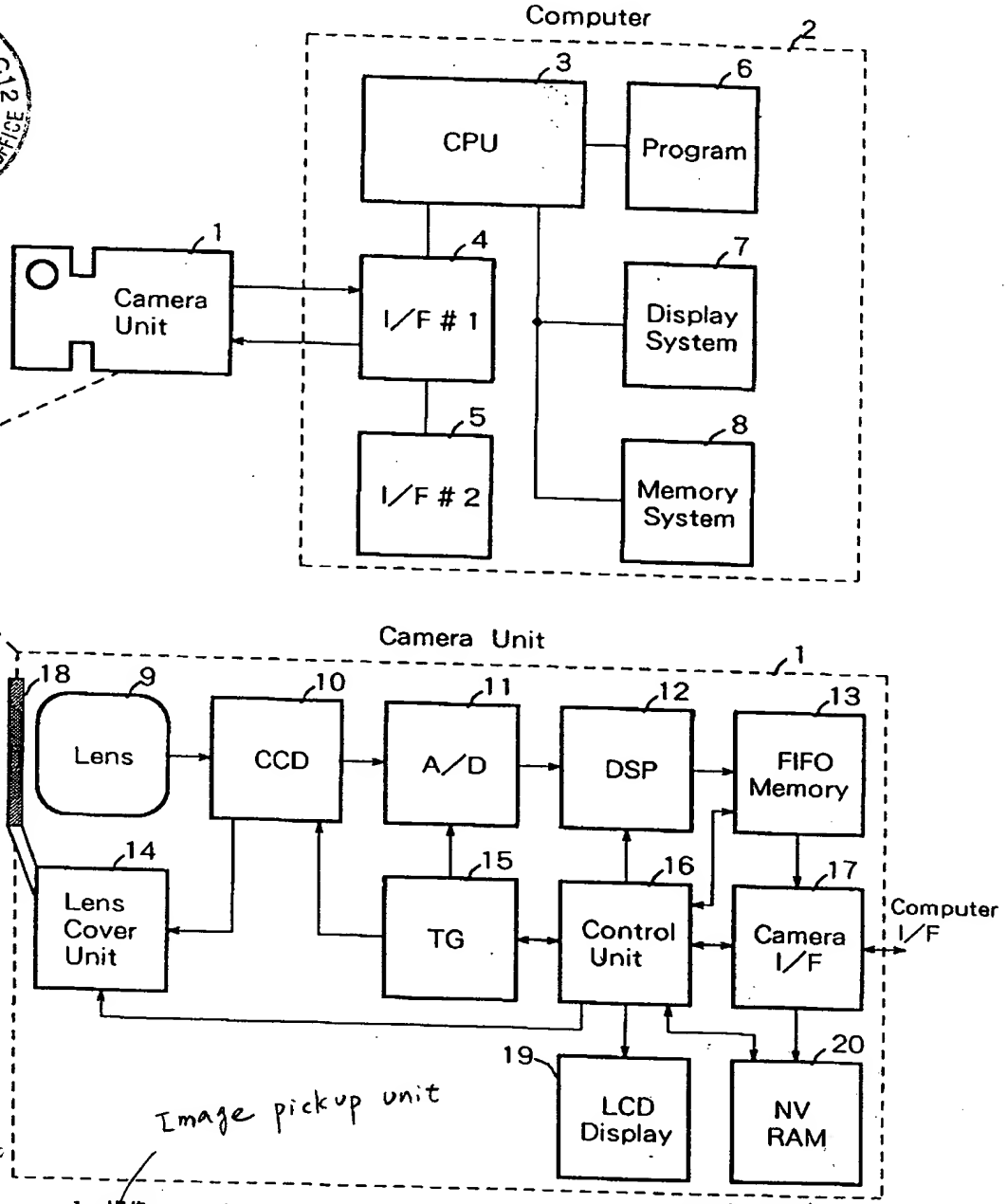


Image pickup unit

CPU unit

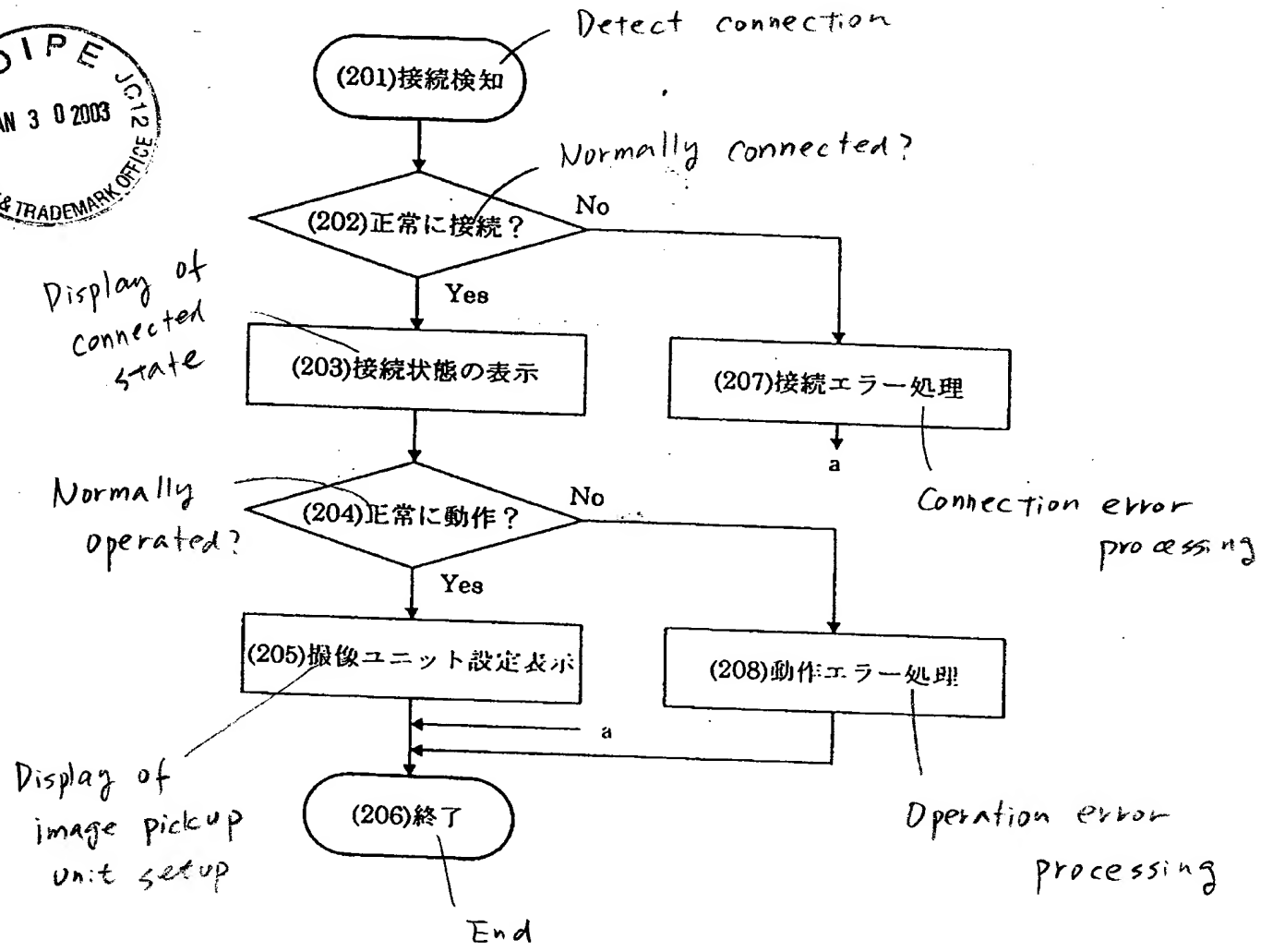
1：撮像ユニット
2：コンピューター — Computer
3：CPUユニット
4：接続端子 } Connection terminal
5：接続端子
6：動作プログラム — Operation program
7：表示装置 — Display system
8：記録装置
9：レンズ光学系

10：CCDユニット — CCD unit
11：A/Dコンバーター — A/D converter
12：デジタル信号処理装置（DSP） — Digital signal processing device
13：FIFOメモリー — FIFO memory
14：レンズカバーユニット — Lens cover unit
15：タイミング信号発生装置（TG） — Timing signal generator
16：コントロールユニット — Control unit
17：外部接続用インターフェイス — Interface for external connection
18：レンズカバー — Lens cover

Memory system

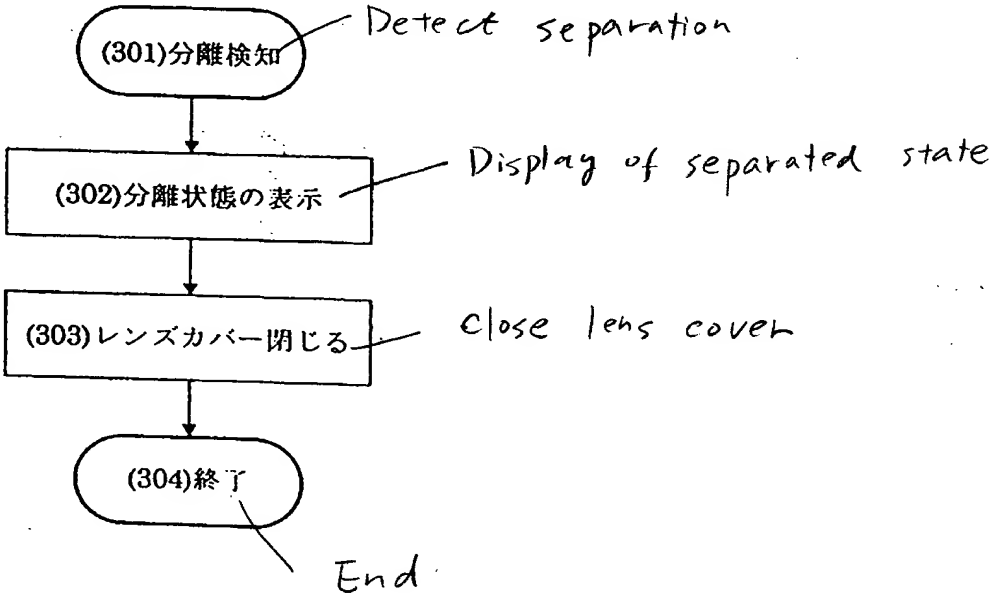
Lens optical system

【図２】　Fig. 2

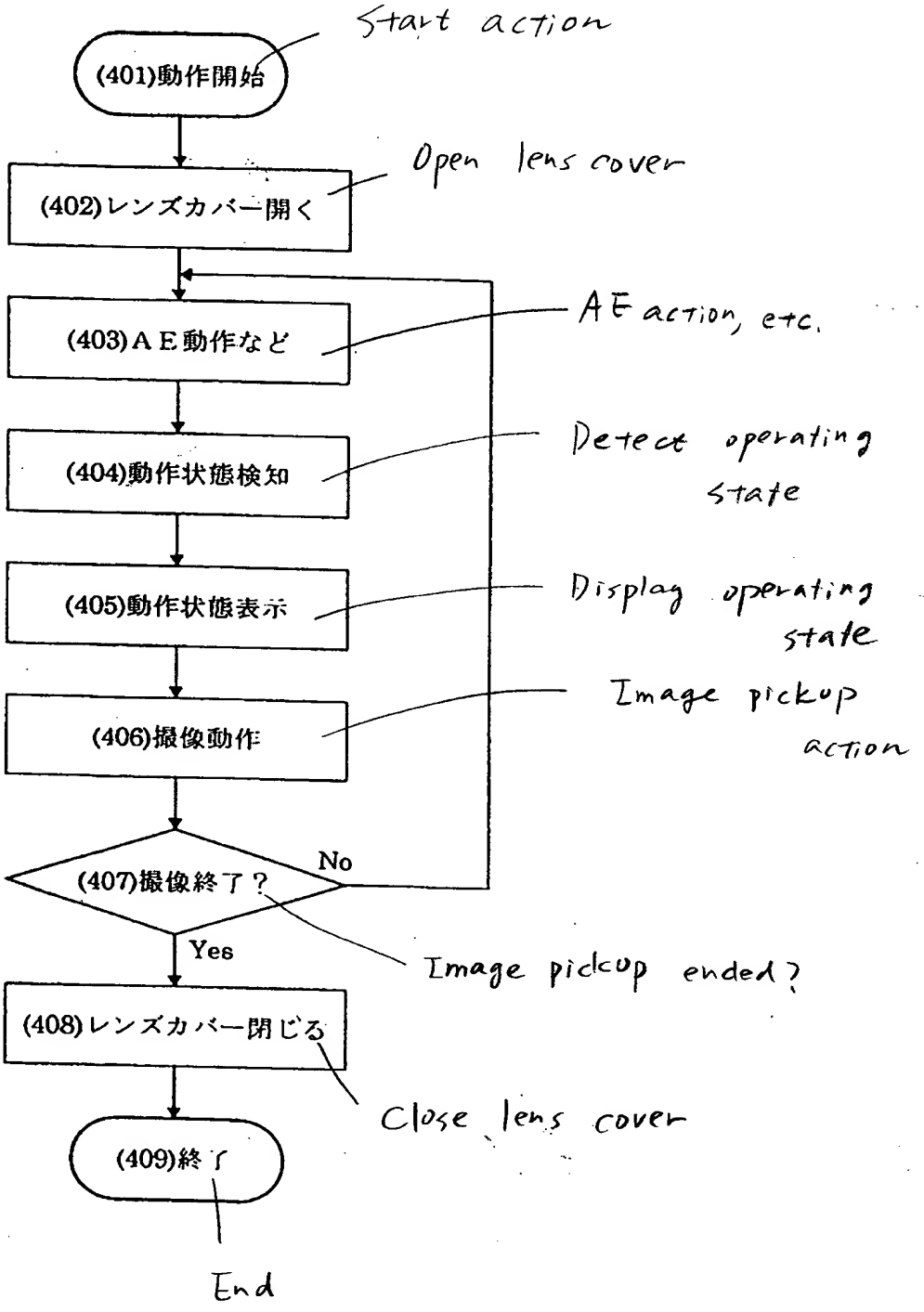


【図３】

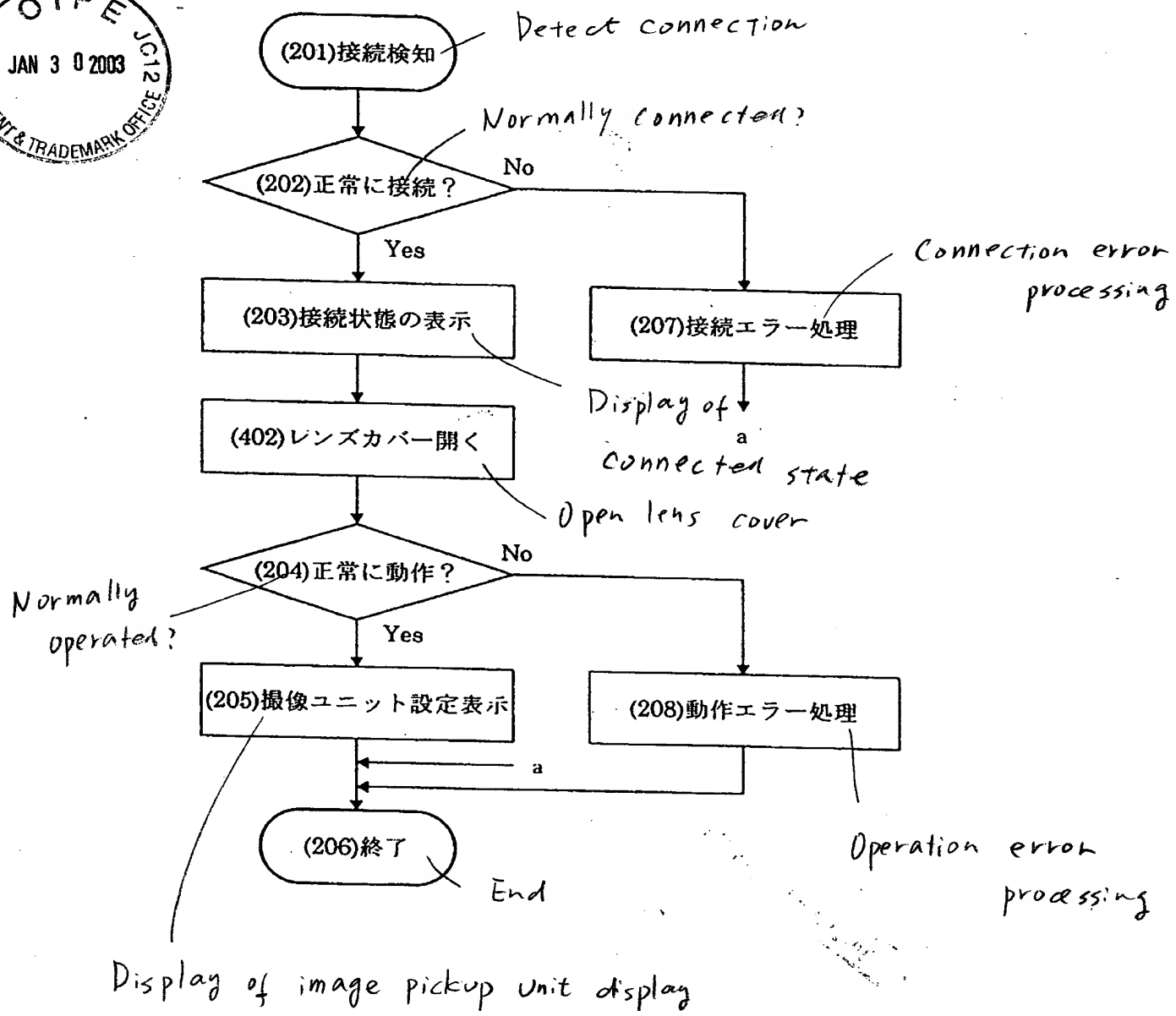
Fig. 3



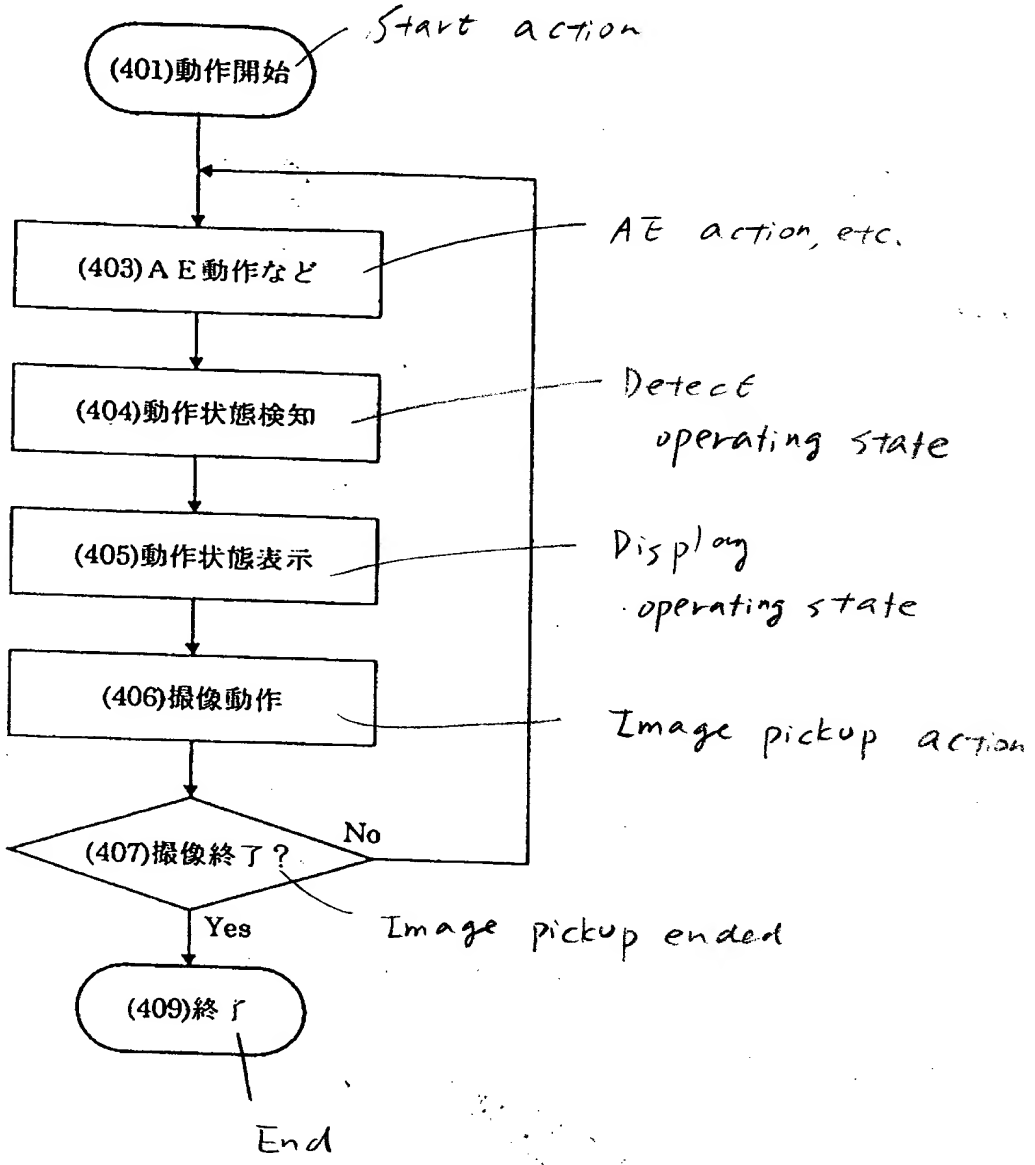
【図４】 Fig.4



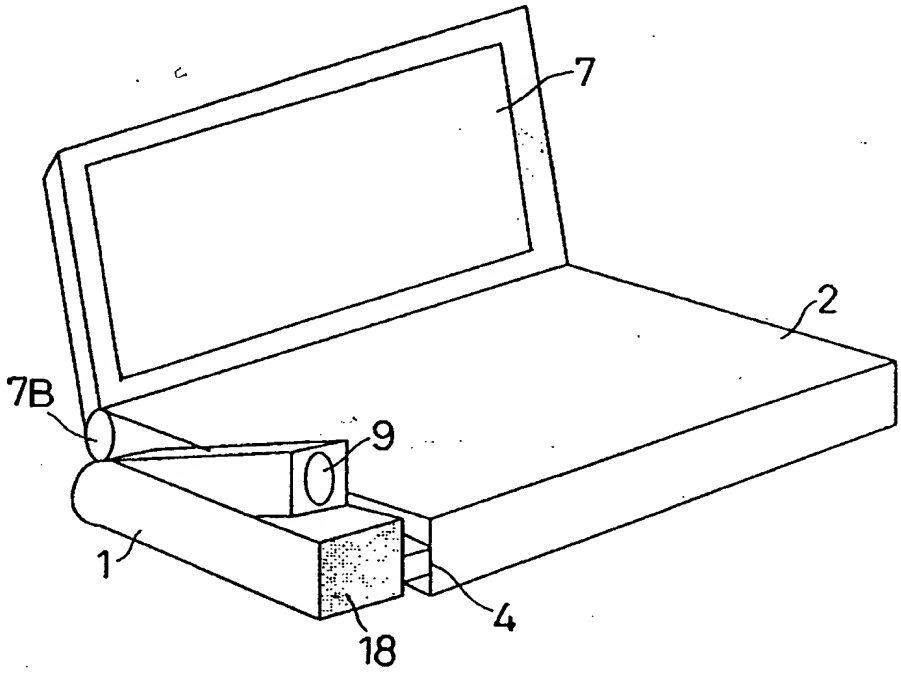
【図５】 Fig. 5



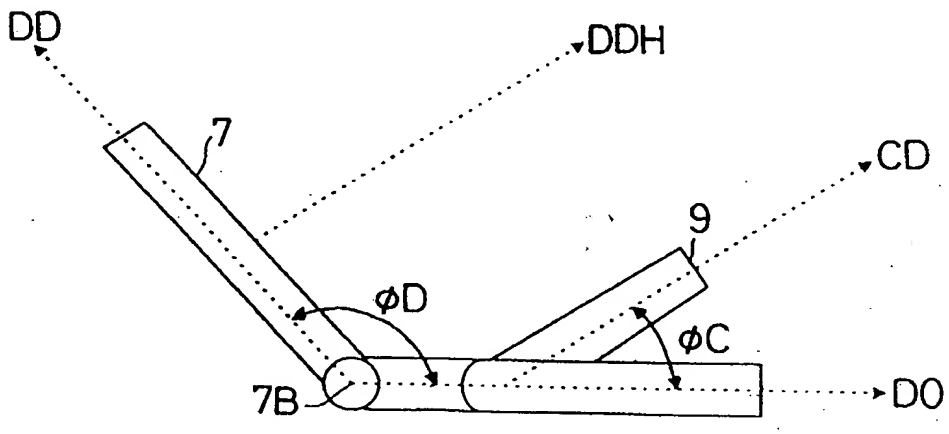
【図６】 Fig. 6



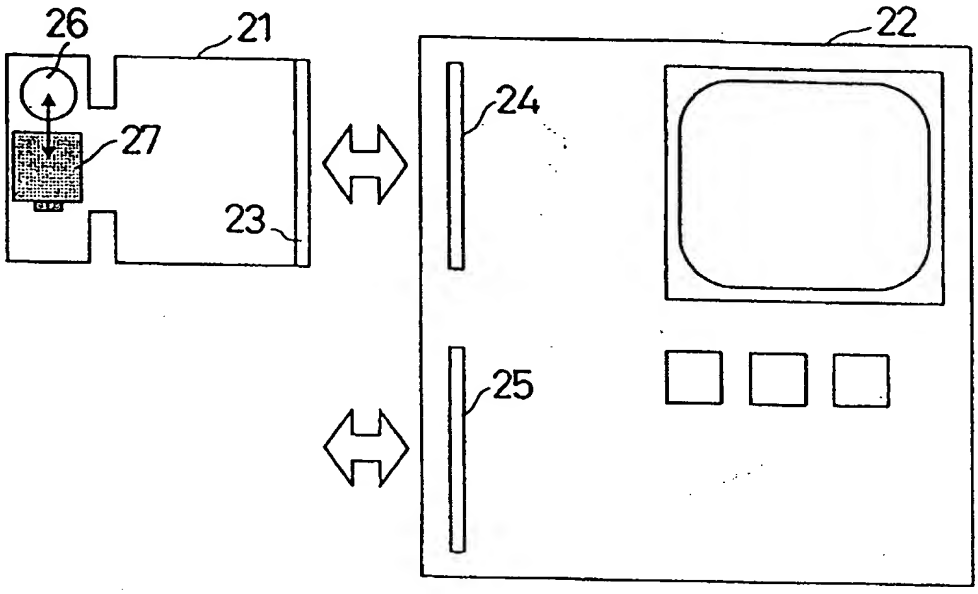
【図７】　Fig. 7



【図８】　Fig. 8



【図９】 Fig. 9



[Name of the Document] Abstract

[Abstract]

[Object] In an image pickup system in which an image pickup unit is connected for use to an image processing computer, an operating state and a connected state of the image pickup unit is displayed to an operator and recorded and thus any erroneous operation is prevented from being performed by the operator of the image pickup system.

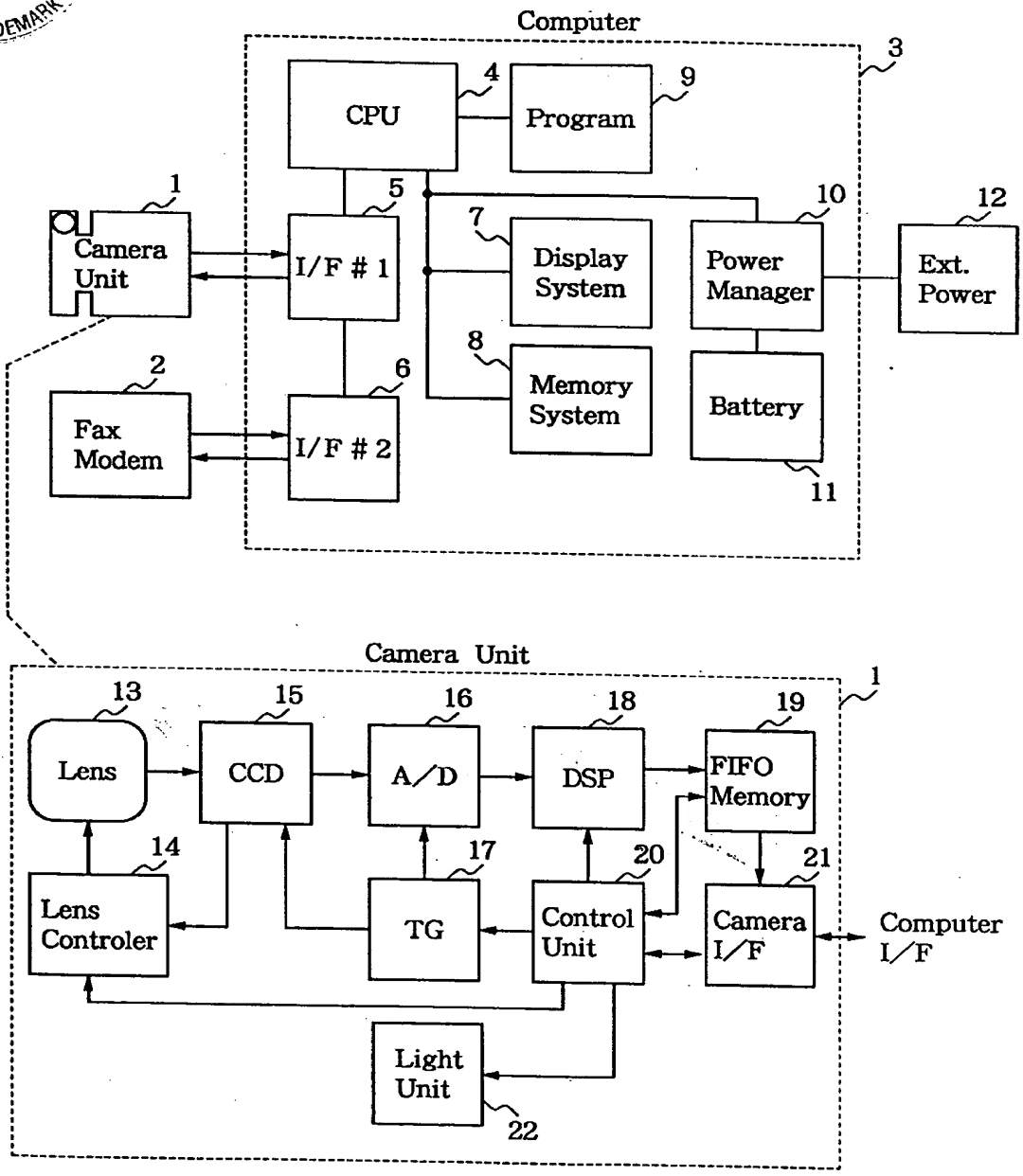
[Constitution] An image pickup system comprising means for transmitting and receiving data between an image pickup unit and a computer which are interconnected, means provided at the image pickup unit or the computer for detecting, displaying and recording an operating state and a connected state of the image pickup unit, and means for causing a device for protecting a lens of the image pickup unit to operate according to the above detection result.

[Elected Drawing] Fig. 1

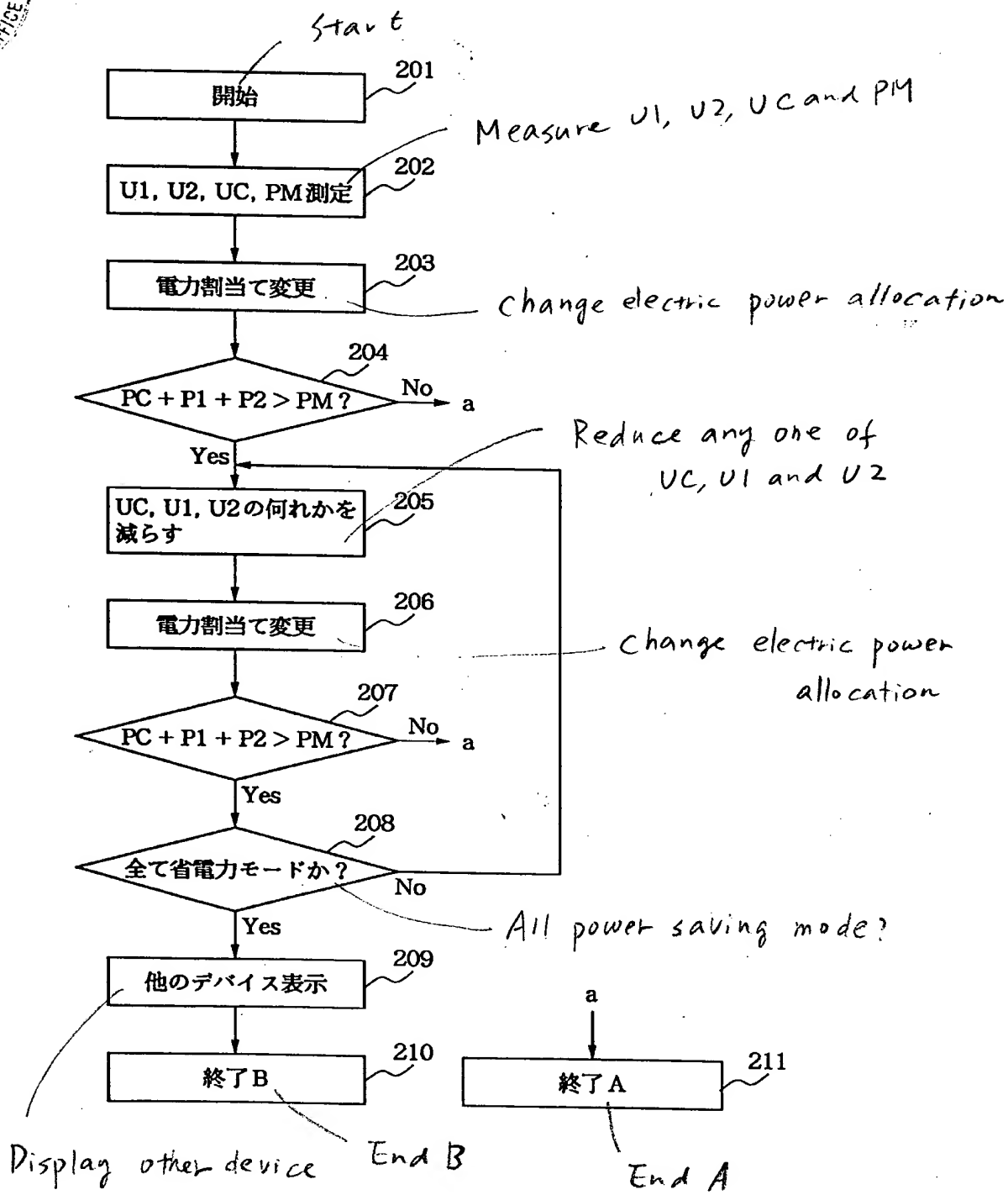
【書類名】　図面 [Name of the Document]

【図１】　Drawings

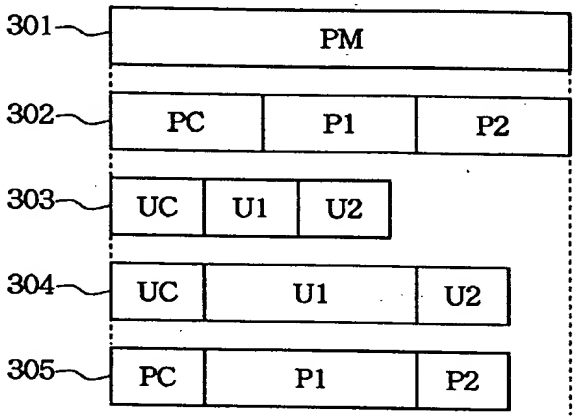
Fig. 1



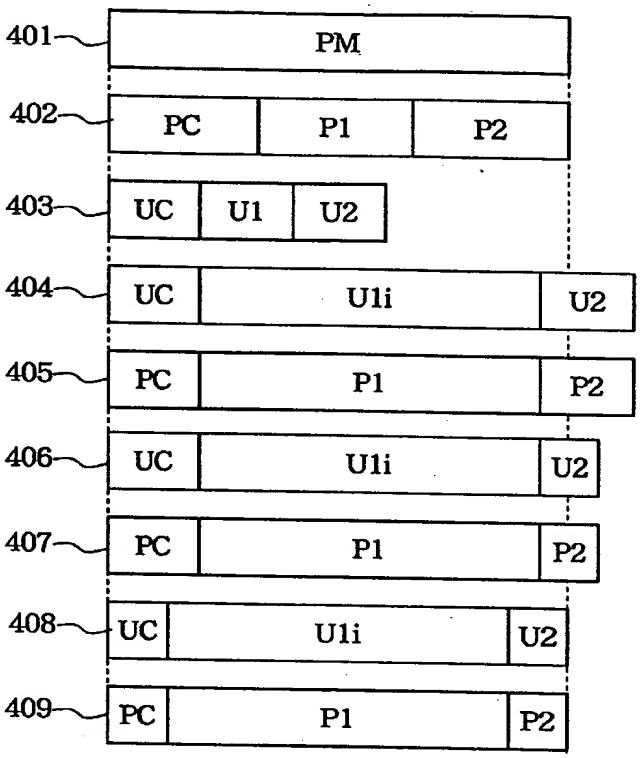
【図２】 Fig. 2



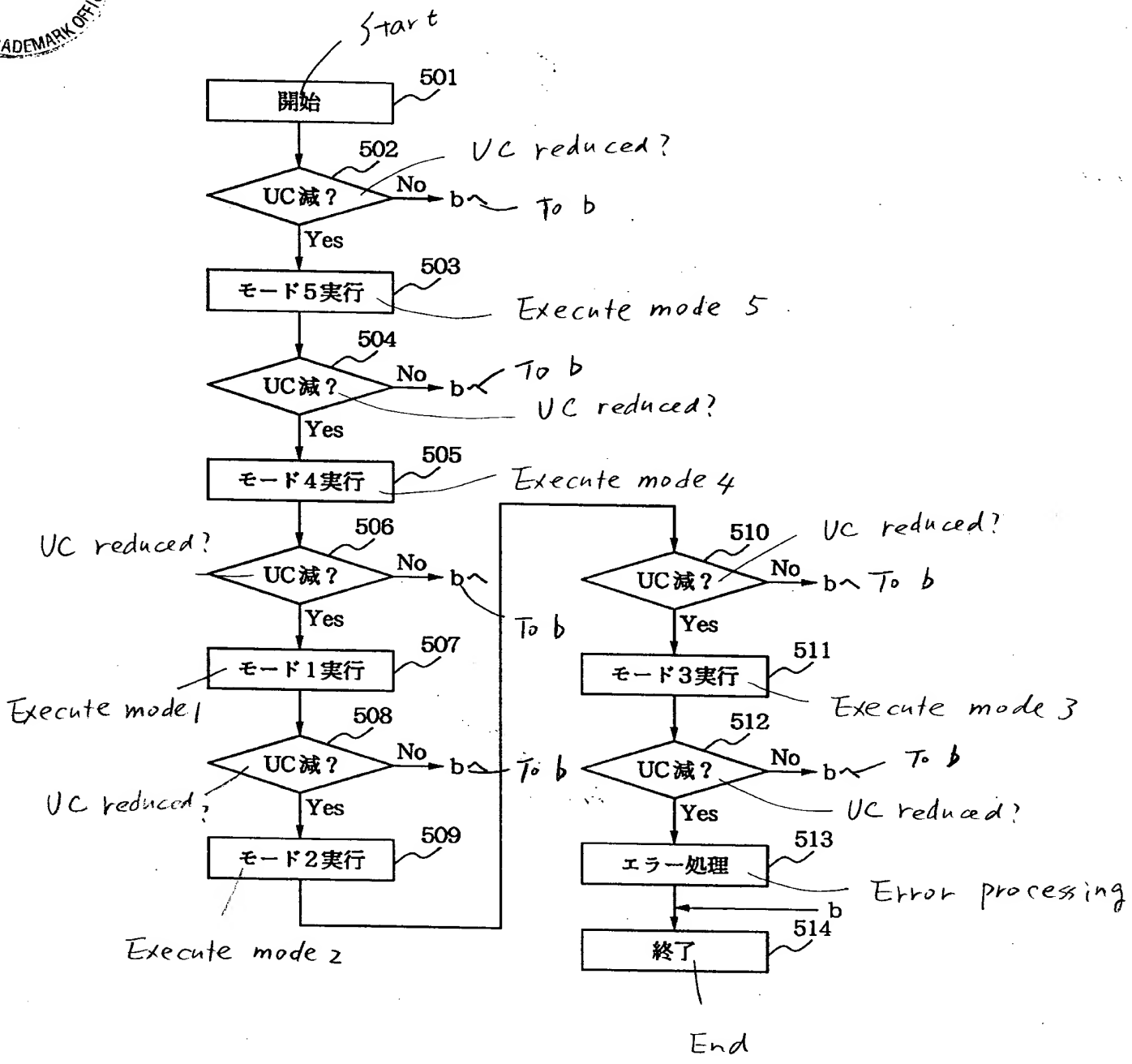
【図３】　Fig. 3



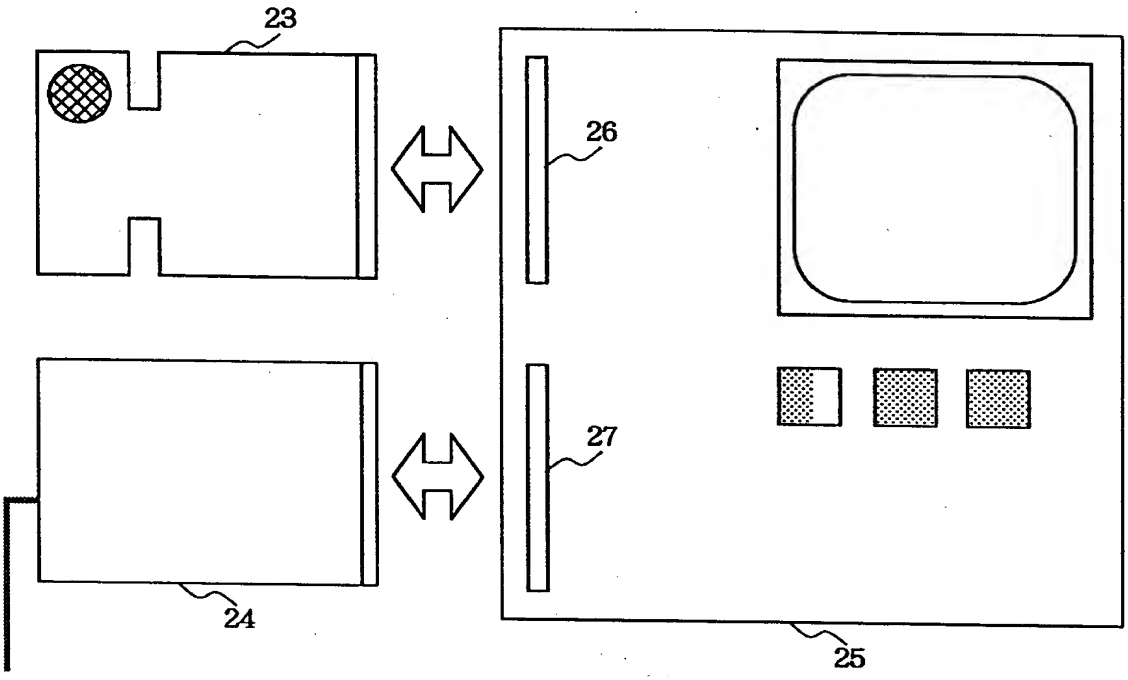
【図４】　Fig. 4



【図５】 Fig. 5



【図６】 Fig. 6



[Name of the Document] Abstract

[Abstract]

[Problem(s)] In a power control system having a device unit removably attachable to a power supply device of a computer or the like, electric power can be allocated to individual device units in an optimum manner.

[Means for Solving the Problem(s)] In a device unit removably attachable to a power supply device of a computer or the like, communication means for transmitting information of power consumption of the unit and stop means for partly stopping a function of the unit according to a control signal sent in reply from the power supply device on the basis of the information of power consumption transmitted by the communication means to the power supply device are provided, while in the power supply device, communication means for receiving from the unit removably attachable the information of power consumption of the unit and control means for comparing the information of power consumption received by the communication means with information of an amount of electric power which can be supplied to the unit from the power supply device and transmitting the control command to the unit so as to partly stop the function of the unit according to this comparison result.

[Elected Drawing] Fig. 1